PATENT ABSTRACTS OF JAPAN

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(71) Applicant : **CANON INC**

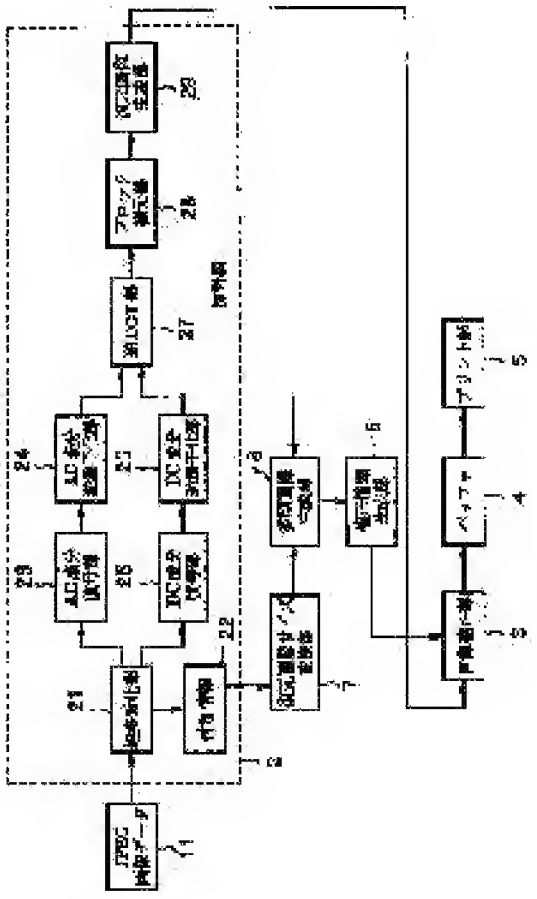
(72)Inventor : **TATSUMI SHINGO**

(54) IMAGE PROCESSOR AND METHOD THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image processor and the method capable of stably performing correction to compressed images at a high speed.

SOLUTION: In a reference image generation part 8, only from the DC components of JPEG image data 1 decoded in a decoder 2, reference images are generated by a size generated in a restored image size conversion part 7. Then, the correction information of restored images is generated based on the reference images in a correction information generation part 6 and restored image data are corrected in an image correction part 3.



JAPANESE [JP,2000-059635,A]

[Translation done.]

* NOTICES *

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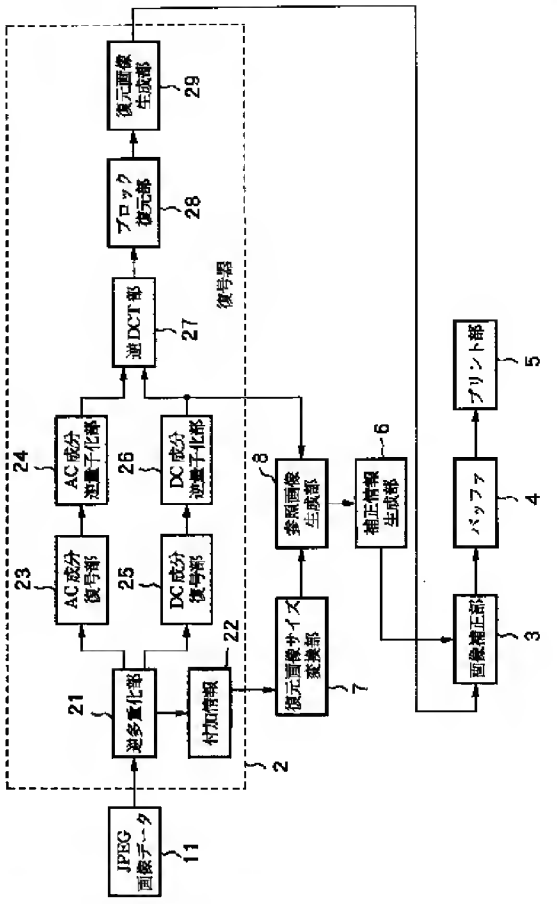
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to an image processing device which decodes the coded image data, and a method for the same about an image processing device and a method for the same.
[0002]
[Description of the Prior Art]With development of an image processing technique in recent years, the picture input device and image forming device which can process a color picture spread, and high definition-ization is progressing. For example, the work of printing out the natural pictures photoed with imaging devices, such as an electronic "still" camera generally called a digital camera, in high minuteness with a color printer is very generally done.
[0003]Generally, in the image processing device which deals with a lot of data of a color picture etc., in order to perform a lot of data storage, transmission, etc. efficiently, data compression technology is used. In particular, generally what is called JPEG compression art is known for the still picture. For example, in the electronic "still" camera mentioned above, after compressing the photoed picture into JPEG form and reducing data volume, it is recording on the memory medium.
[0004]When photoing a picture with an electronic "still" camera, it is common that various processings are performed to the photoed picture. For example, image processing, such as exposure correction by optical diaphragm, a shutter, etc., black balance amendment, white balance correction, gamma correction, matrix transformation of a color to the data

Drawing selection

Representative draw



[Translation done.]

picturized by the electronic imaging device, is performed.
[0005]However, correction errors may remain by the various amendments to such a taken image. Especially in an electronic "still" camera, in order to photo a still picture, the picture information of a photographic subject must be amended within few shutter periods, therefore correction errors remain easily. And if the taken image which has such a residuum is printed out, a residuum will appear notably.
[0006]Then, in the conventional electronic "still" camera, after having restored the taken image which carried out compression preservation at the time of print-out of a taken image, having extracted the feature of this whole image restoration, generating required correction information and performing amendment based on this correction information, actual print-out was presented.
[0007]
[Problem(s) to be Solved by the Invention]However, in print-out of the above-mentioned conventional electronic "still" camera, in order to generate correction information, the picture feature needed to be extracted based on the full image information of image restoration. Therefore, the processing time for picture feature extraction started, and the processing time as the whole was also increasing. In order to shorten this processing time, there is also a method of performing processing by hardware, but it will cause a high cost.
[0008]Since the pixel number which should be processed increases with high-resolution-izing of an electronic "still" camera in recent years, the above-mentioned problem is becoming still more serious.
[0009]This invention is made in order to solve the problem mentioned above, and it is a thing.
The purpose is to provide an image processing device which can perform the receiving compensation process at high speed and stably, and a method for the same.

[0010]
[Means for Solving the Problem]An image processing device of this invention is provided with the following composition as a way stage for attaining the above-mentioned purpose.
[0011]Namely, an input means which inputs coding data which coded a spatial frequency component of an original image, An image restoration means to decode said coding data for every the dc component and alternating current component, and to generate image restoration data of an original image, A size generating means which generates different image comparison size from size of said original image, An image comparison creating means which generates an image comparison in said image comparison size based on a dc component decoded in said image restoration means, Based on said image comparison, it has a correction information creating means which generates correction information of said image restoration data, a compensation means which amends said image restoration data based on said correction information, and an output means which outputs image restoration data amended by said compensation means.
[0012]
[Embodiment of the Invention]Hereafter, one embodiment concerning this

invention is described in detail with reference to drawings.
[0013]- In order to make easy an understanding of general JPEG compression and an image restoration amendment book embodiment, explain general JPEG compression first.
[0014]Drawing 2 is a block diagram showing the composition of the coding equipment 100 which performs general JPEG compression. In the figure, the original image data 1 which consists of a MxN pixel is divided into the unit block of a predetermined pixel number (usually 8x8 pixels) in the blocking part 2. The image data for every block divided in the blocking part 2 is DCT section (discrete cosine transform machine) 3, and is changed into 64 frequency components of the eight ingredients eight ingredients of horizontal direction x perpendicularly it is called a DCT coefficient. Among this DCT coefficient, it is quantized by the DC component quantizing part 4, and a DC component (1 of the coefficient of 64 pieces) is sent to the multiplexing part 8, after entropy-code-modulation processing is carried out in the DC component coding part 5. On the other hand, among DCT coefficients, an AC component (64 to one piece) is sent to the multiplexing part 8, after being quantized by the AC component quantizing part 6 and also carrying out entropy-code-modulation processing in the AC component coding part 7.
[0015]The DC component and AC component by which entropy code modulation was carried out in the multiplexing part 8, And the additional information 9 for constituting the information on the quantization table used for the processing which results in entropy code modulation, an entropy-code-modulation table, etc. and also the information on the pixel size of an original image, and a file, etc. are multiplexed, and it outputs as the JPEG image data 10. That processings of coding differ by the DC component and an AC component here, In coding of a DC component since it has the characteristic that a DC component is equivalent to the average value of an 8x8-pixel block, and average value does not not much change a lot between the next blocks, It is because what is called DPCM (difference pulse code modulation) that codes the difference of a DC coefficient between the blocks which make a straight line is performed.
[0016]Drawing 3 is a figure which restores the JPEG image generated with the coding equipment 100 shown in drawing 2, and is printed out after performing picture amendment and in which showing the composition of a common printer.
[0017]In the figure, the JPEG image data 11 generated by imaging devices, such as an unillustrated digital camera, is sent to the decoder 2. The JPEG image data 11 is divided into the additional information 22, and the AC component and DC component by which entropy code modulation was carried out in the demultiplexing part 21 of the decoder 2. The separated DC component results in reverse DCT section 27 through the DC component decoding part 25 and the DC component inverse quantization part 26. On the other hand, the separated AC component results in reverse DCT section 27 through the AC component decoding part 23 and the AC component inverse quantization part 24. In reverse DCT section 27, reverse DCT transformation is performed and an original image is restored [in / through the block restoration section 28 / in the output / the image restoration generation part 29].
[0018]Thus, it turns out [of the process in the coding equipment 100 for

the process in the decoder 2 which restores an original image from the JPEG image data 11 to generate the JPEG image data 10 from the original image data 1 shown in drawing 2] that is exactly passed through reverse. About operation of each part in the decoder 2 which decodes JPEG numerals, since it is common knowledge, detailed explanation is omitted here.

[0019]The picture restored with the decoder 2 is sent to the picture amendment part 3 and the correction information generation part 6. In the correction information generation part 6, characteristic information is extracted from the restored picture, the information (following, correction information) which should be amended based on this characteristic information is generated, and it sends to the picture amendment part 3. The average value and peak value which are acquired by taking the histogram of a picture, for example, an APL value, etc. can be considered to be the characteristic information extracted from a picture here.

[0020]In the picture amendment part 3, based on the correction information inputted from the correction information generation part 6, processing treatment for which it asks to image restoration is performed, and it outputs to the buffer 4. In the buffer 4, data is stored until data required to send to the print section 5 is assembled, and data is sent to the print section 5 after that, and it prints.

[0021]It differs in a reference number by the JPEG image data 10 shown in drawing 2, and the JPEG image data 11 shown in drawing 3 because both pass a certain transmission line, and the contents are the same. A transmission line is a general term for a means to perform the transfer by memory media, such as a transmission line of a cable or radio (IrDA is included), a magnetic storage medium, and a semiconductor storage medium, etc. here.

[0022]- Explain the image restoration amendment in this embodiment, next the image restoration amendment in this embodiment.

[0023]Drawing 1 is a figure showing the composition of the printer in this embodiment which restores the JPEG image generated with the coding equipment 100 shown, for example in drawing 2, and is printed out after performing picture amendment. In the figure, the same number is given to the same composition as drawing 3 mentioned above, and explanation is omitted. In drawing 1, image correction information is made generable only based on the DC component obtained during JPEG decoding by newly adding the image restoration size conversion part 7 and the image comparison generation part 8 to the composition shown in drawing 3.

[0024]Based on the image size information shown by the additional information 22 separated from the JPEG image data 11, the image restoration size conversion part 7 changes image size so that it may consider that the unit block in the case of JPEG coding (8x8 pixels) is 1 pixel. The size information generated by the image restoration size conversion part 7 is sent to the image comparison generation part 8. On the other hand, the DC component for every JPEG unit block decoded through the DC component decoding part 25 and the DC component inverse quantization part 26 is inputted into the image comparison generation part 8, In the image comparison generation part 8, an image comparison is generated based on the two above-mentioned input, and this image

comparison is outputted to the correction information generation part 6. An image comparison is a picture constituted so that the DC component for every JPEG unit block might correspond to 1 pixel of an image comparison here.

[0025]In the correction information generation part 6, the characteristic information on a picture is extracted based on the above-mentioned image comparison, correction information is generated from this information, and it sends to the picture amendment part 3. That is, in this embodiment, it will consider that the DC component which is the average value within the unit block of an original image is a central value within the block concerned, and the correction information of a picture will be generated. Average value, a peak value, white balance information, black balance information, etc. which are acquired by taking the histogram of a picture, for example can be considered to be the characteristic information extracted from a picture here. Although the more concrete example of the correction information generation treatment in this embodiment is mentioned later, since the data volume of the image comparison which is the sources of information in the case of picture information extraction decreases, it turns out that the processing speed of correction information generation improves.

[0026]In the picture amendment part 3, based on the correction information inputted from the correction information generation part 6, processing treatment for which it asks to the image restoration inputted from the image restoration generation part 29 is performed, and it outputs to the buffer 4. In the buffer 4, data is stored until data required to send to the print section 5 is assembled, and data is sent to the print section 5 after that, and it prints. Thereby, the good printing image which reduced the residuum at the time of photography can be obtained.

[0027]The stable amendment is attained [not being influenced by a noise etc. to various image data, and] by extracting the characteristic information of a picture further, based on the average value within a unit block in this embodiment, as mentioned above. Hereafter, the example is given and explained about the stable correction information generation processing by this embodiment.

[0028]- Explain briefly by making into an example the case where amendment **** of an exposure correction error and the exposure correction error of an electronic "still" camera are amended.

[0029]Generally, in order to amend an exposure correction error, it is necessary to extract the luminance distribution of an inputted image. Therefore, the average value of the luminosity of the whole picture and the peak value of luminosity were extracted, for example, the correction amount was determined based on both level, and the whole image levels were amended.

[0030]However, in an inputted image -- in the case of photography by an electronic "still" camera, when a part of the photographic subject has a high luminance level, the point light source is included, for example in the photographic subject -- only several pixels may be a high level. When the information on such a momentary peak level determines the proper luminance level of the whole picture, it will be an obstacle.

[0031]Then, as shown in this embodiment, when a correction amount is determined using the average value (DC component) within a certain unit

block, good information extraction is attained without being influenced by momentary peak level information which was mentioned above, and picture amendment good as a result is attained.
[0032]Similarly, when amending the exposure correction error of an electronic "still" camera, a luminance histogram may be extracted from an inputted image and picture amendment may be performed based on this histogram. Thus, when referring to a histogram, in order to reduce the influence of momentary information which was mentioned above, it is desirable to perform a certain equalizing processing. That is, it is necessary to the whole inputted image to perform the equalizing processing further with the processing which extracts a histogram.
[0033]Then, since equalization is already made in the image comparison which is a candidate for extraction of a histogram according to this embodiment, it becomes possible to generate correction information simpler.
[0034]- Explain the correction information generation treatment for white balance correction, next white balance correction.
[0035]White balance correction is a function for amending the light source to a photographic subject in the case of photography by an electronic "still" camera. Therefore, the information which should be amended is superimposed by the whole picture. In other words, since what is called color temperature change of a light source is superimposed by the whole photographic subject, it will be superimposed on this color temperature information by the photoed whole picture.
[0036]Therefore, in the spatial frequency component in a taken image, since color temperature information is mostly equivalent to a DC component, it is dramatically efficient to perform information extraction for white balance correction based on the picture which consists only of a DC component within a unit block as shown in this embodiment.
[0037]The picture referred to when generating correction information according to this embodiment, as explained above, Since the data volume of the image comparison which is the sources of information in the case of picture information extraction by considering it as the picture which considered that the DC component which is the average value within the unit block of an original image was a central value within the block concerned, and generated it instead of the image restoration of an original image decreases, load is reduced and processing speed improves.
[0038]The stable amendment is attained [not being influenced by a noise etc. to various image data, and] by extracting the characteristic information of a picture based on the average value within a unit block.
[0039]
[Other embodiments] Even if it applies this invention to the system which comprises two or more apparatus (for example, a host computer, an interface device, a reader, a printer, etc.), it may be applied to the devices (for example, a copying machine, a facsimile machine, etc.) which consist of one apparatus.
[0040]The purpose of this invention the storage which recorded the program code of the software which realizes the function of an embodiment mentioned above, It cannot be overemphasized that it is attained, also when a system or a device is supplied and the computer (or CPU and MPU) of the system or a device reads and executes the program code stored in the

storage.
[0041]In this case, the function of an embodiment which the program code itself read from the storage mentioned above will be realized, and the storage which memorized that program code will constitute this invention.
[0042]As a storage for supplying a program code, a floppy disk, a hard disk, an optical disc, a magneto-optical disc, CD-ROM, CD-R, magnetic tape, a nonvolatile memory card, ROM, etc. can be used, for example.
[0043]By executing the program code which the computer read, Based on directions of the program code the function of an embodiment mentioned above is not only realized, but, It cannot be overemphasized that it is contained also when the function of an embodiment which performed a part or all of processing that OS (operating system) etc. which are working on a computer are actual, and was mentioned above by the processing is realized.
[0044]After the program code read from the storage was written in the memory with which the function expansion unit connected to the expansion board inserted in the computer or the computer is equipped, It cannot be overemphasized that it is contained also when the function of an embodiment which performed a part or all of processing that CPU etc. with which the expansion board and function expansion unit are equipped are actual, based on directions of the program code, and was mentioned above by the processing is realized.
[0045]
[Effect of the Invention]As explained above, according to this invention, it becomes possible to perform the compensation process to a compressed image at high speed and stably.
[0046]

[Translation done.]